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Removal of Pollutants from Wastewater using Organic Materials

EL-Hadidi, E. M.[1]; Dina A. Ghazi[1]; Eman M. Rashwan[2]and Dina L. Ibrahim[1*]

[1]Soils Department, Faculty of Agriculture, Mansoura University, Mansoura, Egypt.
[2]Soil Fertility and Plant Nutrition Research Dept., Soil, Water and Enviro. Res. Inst., Agric .Res .Center.

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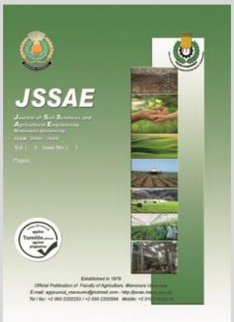

ABSTRACT

Recycling wastewater in agriculture is a viable and sustainable alternative for decreasing fresh water consumption. Treated wastewater is one of the water resources that can be used for irrigation purposes if it meets the appropriate health conditions. The main objective of this study was to remove hazard elements such as B (boron) from wastewater by adsorption using organic materials. Five sources of agriculture and industrial drainage waters were collected from different locations .Two types of the wastewaters: 1) Agricultural drainage wastewater were collected from (Sherbien - Mietghamer- El-Mansoura) , 2) Industrial wastewater were collected from {Delta company of fertilizers and chemicals (Talkha) - Food factory (Aga)}.The treating organic materials were (Sawdust and compost) to remove pollutants from wastewater. The obtained results indicated that sawdust has the super priority of removing pollutants than compost. Sawdust is used as adsorbent for minimizing values of pH, EC, TDS, TSS, RSC, SAR, PS and B. It was found that all the parameters were decreased in waste waters samples taken for study compared to before treatment. Finally, it could be concluded that, sawdust material was the best material for wastewater treatment under these experimental conditions.

Keywords: Organic material - Sawdust - compost - Pollutants -Wastewater -Treatment**.**

INTRODUCTION

Agriculture is the largest user of water, and the utilization of treated urban wastewater for agricultural irrigation is a growing practice worldwide. The use of partially treated wastewater in agriculture helps conserve and expand available water supplies and can contribute toward a more integrated management of water resources. Moreover, the nutrients (phosphorous and nitrogen) found in treated wastewater can be very valuable for farmers. Depending on the treatment technology employed, the levels of phosphorous and nitrogen in the treated wastewater effluent can be very high. These elements in the effluent can increase crop yield and size. Yet if not planned, managed, and implemented properly, water reuse can be associated with a number of risks, including public health, agronomic, and environmental risks as (Rodriguez, *et.al*, 2020).

The search for low-cost adsorbents, preferably derived from locally available waste materials, has become nowadays a main research focus.(Leiviska, 2014) mentioned that the utilization of by-products and waste materials as a raw material for water treatment chemicals has been suggested as a way to reduce costs. Lignocellulosic materials, like sawdust, are excellent raw materials since they are abundant, renewable, and cheap. The main uses of sawdust are mainly in particle-board, as an energy source, and as cattle bedding material. Sawdust has been studied as a water treatment material both as such and after modification. For the removal of anions (e.g. nitrate, vanadate), sawdust has to be chemically modified by adding cationic groups. Sawdust has proven to be an excellent material for the removal of anions from water. (Parihar and Malaviya, 2013) revealed that after treatment with sawdust, the treated effluent had lower values of the parameters studied than the untreated effluent. The reduction in pollution load of treated effluent may be attributed to the adsorption of chemicals in effluent by sawdust through hydrogen bonding and ion exchange mechanism. Sawdust has been revealed of great interest in terms of hazard elements removal capability and has been considered as a promising tool for effluent decontamination .Indeed, sawdust presented the advantages of being an abundant material and requiring little processing. This Sawdust in the treatment of hazard elements contaminated wastewater 113 product is rich of polyphenolic and carboxylic groups contained in its organic compounds like cellulose, hemicellulose and lignin. These functional groups would favor the uptake of hazard elements ions to the adsorbent surface.

Sawdust was used as adsorbent for removal of pH, TDS, TSS & Color from textile effluent. It is found that pH was decreased from 7.9 to 7.2, the maximum percent removal of 45.50% was observed for TSS & the maximum percent removal of 27% was observed for TDS. Also the color of textile effluent changes from Dark Brown to Light (Nitin and Sunil, 2015).

The investigations revealed that after treatment with sawdust, the treated effluent had lower values of all the parameters than the untreated effluent. The reduction in pollution load of treated effluent may be attributed to the adsorption of chemicals in effluent by sawdust through hydrogen bonding and ion exchange mechanism. However, adsorption process is considered very effective in textile wastewater treatment as it proves superior to the

*** Corresponding author.**
E-mail address: dinalokman@yahoo.com
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other processes by being sludge free and can completely remove even very minute amounts of dyes in wastewaters (Nigam, *et al.*, 1996).

Compost as a low-cost sorbent was investigated by (Muhammad, *et al.,* 2007) who stated that the compost-filled wetland were better than that of the gravel-filled wetland in terms of removal of COD and BOD., it has proved that this eco-technology could also be used effectively for water quality enhancement in Pakistan.

The aims of this study are to alleviate the hazard elements, also investigating the wastewater for improving the quality by using new types of material such as sawdust and compost and improving the wastewater quality after treating and reuse for irrigation.

MATERIALS AND METHODS

The present study was postulated to investigate treatment of wastewater with inorganic and organic materials to reduce pollutants in this water. Five sources of agriculture and industrial drainage water were collected from different locations .Two sources of the wastewaters: 1-Agricultural drainage wastewaters were collected from (Sherbien.-Mietghamer-El-Mansoura) , 2- Industrial wastewater samples collected from Delta company of fertilizers and chemicals (Talkha) and Food factory (Aga).The treating materials were, organic materials (Sawdust and compost). Three weights (0.5, 1, 1.5 g) of every material (sawdust and compost) was prepared which was gradually added to 100 ml water then it was stirred by mechanical shaker for (30, 60, 90 minute) and samples were left for (1, 2, 3 days) and then the estimations were made before and after treating.

The chemical composition of the two organic materials used for treating wastewater samples in this study are tabulated in Tables (1&2)

Table 1. Chemical analysis of sawdust.

Components	Value
C	50-49 %
O	45-44 %
H	6 %
N	.01-1%
Total carbohydrate (Cellulose- Hemicellulose)	65-70%

Table 2. Chemical analysis of compost.

Compost characteristics	Value
Moisture (%)	23.00
Bulk density (Mgm^{-3})	700.00
pH (1:10) susp.	7.90
EC (1 : 10) dSm^{-1},sat,ext.	5.04
OM (%)	27.53
C (%)	15.97
N (%)	1.20
C/N ratio	13.31 : 1
P (%)	0.62
K (%)	1.09

The chemical analyses of the investigated wastewaters were conducted according to the standard methods described by page *et al.,* (1982), as follows**:**

Both pH and electrical conductivity (EC) values were immediately determined at the sampling points using pH meter, model pH con 10 series, Cole Parmer and conductmeter.

Calcium and magnesium were determined by titration with the versenate solution (EDTA) using the murexide and EBT as indicators (Jackson, 1969).

Sodium and potassium were determined photometrically using a digital flame photometer (Model; 2655.00.Cole Parmer).

Carbonate and bicarbonate were determined by titration with HCl (0.01N) using Phenolphthalein and methyl orange as indicators.

Sulfate were calculated by subtracting the total determined soluble anions from the total soluble cations.

Total nitrogen (TN), and total phosphorus (TP), were determined using the standard methods described by APHA (1989).

Boron was determined colorimetrically using carcumine material as described by Bingham (1982).

TSS (Total suspended solids) were determined by filtration and weighing the suspended materials after drying at 105^{0}C. SAR was calculated using this equation: SAR=

RSC was calculated using the following equation:

$$\mathbf{RSC= (Co_3^{-2} + HCo_3^{-}) - (Ca^{+2} + Mg^{+2})\ meql^{-1}.}$$

PS was calculated using the following equation:

$$\mathbf{PS=CL^{-} + ½\ So_4^{-2}\ meql^{-1}}$$

RESULTS AND DISSCUSSION

Data in Tables (3 and 4) illustrate chemical analysis of some parameters affecting cleaning and quality of studied wastewater samples before treatment and remediation.data show that studied wastewater samples have low value of EC (less than 4.0 dSm^{-1}) except the wastewater sample of delta company of fertilizers and chemicals which contained 5.43 dSm^{-1}(saline water).values of pH revealed that all studied wastewater samples have pH values less than 9.0 except the sample of Delta Company of Fertilizers and Chemicals which have a pH value more than allowable limit (9.0). It reached 10.2 (pH value) because of NH_4 resulting from this industrial process. results also appear that the TSS values differed according to the type of usage of these studied wastewaters and ranged between 352-3475.0 mgl^{-1}. The highest values are due to industrial wastewaters and the lowest value are found in agricultural drainage water.as shown in the above mentioned tables, the data obtained point to that the dominant cation is sodium (3242.31 mgl^{-1}) and the dominant anion is sulphate (1839.39 mgl^{-1}).

Concerning to macro and micro nutrients., data revealed that wastewater sample of Delta Company of Fertilizers and Chemicals contained the highest value of nitrogen (194.6 mgl^{-1}) because of final product of nitrogen fertilizers and containing this wastewater of ammonium,

While studied wastewater samples contained less than permissible limits of nutrients except boron (above 6.261mgl^{-1}) for this reason boron will be taken in consideration in these remediation for studied wastewaters to determine its value.

The wastewater sample of food factory is rich with phosphorus (14.51 mgl^{-1}), while wastewater sample of Mansoura obtained the highest value of potassium (92.51 mgl^{-1}).the chemical analysis of used wastewater samples is shown in Tables (3 and 4).

Table3. Chemical analysis of some parameters in studied waste water samples before treating.

Waste water sample, location	Ec, dSm^{-1}	PH	Tss (mgL^{-1})	Soluble Anions ($meqL^{-1}$)								RSC ($meqL^{-1}$)	SAR	PS ($meqL^{-1}$)
				Cations				Anions						
				Ca	Mg	Na	K	Co_3^-	HCo_3^-	Cl^-	So_4^-			
1-Sherbien drainage water	0.55	8.36	352.00	12.44	5.40	328.16	6.00	-	41.63	86.71	222.36	23.79	109.87	197.88
2-Mietghamer drainage water	1.27	8.79	812.80	21.28	6.24	777.68	7.60	-	84.17	180.22	548.41	56.65	209.64	454.42
3-El-Mansoura drainage water	1.69	8.97	1081.60	49.89	17.99	994.76	18.96	-	94.22	198.62	788.76	26.34	170.75	593.00
4-Delta Comp. of Fert. (Talkha)	5.43	10.20	3475.20	93.97	48.96	3242.31	89.96	-	389.69	1246.12	1839.39	246.76	383.53	3165.81
5-Food Factory (Aga)	1.63	8.95	1043.20	45.22	14.89	967.33	15.76	-	86.92	185.12	771.16	26.81	176.44	570.70

***PS= Potential Salinity**

Table 4. Some nutrients contents in studied waste water samples before treating.

Wastewater sample, location	Macronutrients (mgL^{-1})			Micronutrients (mgL^{-1})
	N	P	K	B
1-Sherbien drainage water	19.32	6.46	86.32	3.842
2-Mietghamer drainage water	12.88	1.02	74.57	4.274
3-El-Mansoura drainage water	16.30	7.31	92.51	4.246
4-Delta Comp. of Fert&chem.(Talkha)	194.65	5.27	47.49	6.261
5-Food Factory (Aga)	34.65	14.51	64.61	3.562

Data in Tables (5 – 9) show the effect of sawdust and compost as remediates materials on treating polluted agricultural drainage water and industrial wastewaters taken from the five locations using three contact times and three concentrations of sawdust. It was found generally that as concentration and contact time increased as concentration of pollutants decreased as a result of ability of this organic materials to remove apart of these pollutants and cleaning this wastewater to be more quality to use it after remediation in agricultural sector as irrigation water and to face the gap between our irrigation resources and our needs of water to irrigate our arable lands. This effect of sawdust and compost can be attributed to possibility of both as adsorbed materials to adsorb apart of these pollutants on their surfaces.These results were confirmed by (Al shahrani, 2012).

Table 5. Effect of using sawdust and compost on treating agricultural drainage waste water sample of sherbien location (at three shaking and contact times and three sawdust concentrations):-

Component	0.5 %			1 %			1.5 %		
	30 minute	60 minute	90 minute	30 minute	60 minute	90 minute	30 minute	60 minute	90 minute
					Sawdust				
pH	8.02	7.89	7.75	7.68	7.63	7.61	7.61	7.51	7.51
EC dSm^{-1}	0.52	0.48	0.48	0.47	0.44	0.42	0.40	0.38	0.35
TSS mgL^{-1}	332.80	307.20	307.20	300.80	281.60	268.80	256.00	243.20	224.00
$CO_3^{=}meqL^{-1}$	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
$HCO_3^- meqL^{-1}$	37.67	33.09	33.09	32.10	28.40	26.22	25.00	23.10	22.40
$Cl^- meqL^{-1}$	77.86	73.11	73.11	72.22	64.00	58.46	56.00	52.00	51.60
$SO_4^{=}meqL^{-1}$	213.27	201.00	201.00	196.48	189.20	180.12	175.00	168.10	150.00
$Ca^{++}meqL^{-1}$	12.15	12.00	12.00	11.90	11.60	11.46	11.24	11.20	11.15
$Mg^{++}meqL^{-1}$	5.00	3.20	3.20	3.17	2.99	2.89	2.55	2.53	2.52
Na^+meqL^{-1}	310.46	289.00	289.00	282.84	263.84	252.00	240.00	227.29	208.16
K^+meqL^{-1}	4.99	3.00	3.00	2.89	2.88	2.45	2.21	2.18	2.17
N $meqL^{-1}$	15.75	14.75	14.49	13.90	12.76	12.23	11.00	9.15	6.21
P $meqL^{-1}$	0.0916	0.0833	0.0761	0.0714	0.0712	0.0678	0.0595	0.0595	0.0476
K $meqL^{-1}$	16.16	15.22	14.52	13.70	12.52	11.43	10.96	9.87	8.61
B mgL^{-1}	1.56	1.42	1.41	1.40	1.38	1.35	1.23	0.97	0.58
RSC $meqL^{-1}$	20.32	17.89	17.89	17.03	13.52	11.87	11.21	9.37	9.47
SAR	105.40	104.83	104.83	100.03	96.72	94.07	91.39	86.74	79.62
PS $meqL^{-1}$	184.49	173.61	173.61	170.46	158.60	150.52	143.50	136.05	126.60
					Compost				
pH	8.23	8.19	8.15	8.12	8.07	8.03	7.98	7.96	7.92
EC dSm^{-1}	0.52	0.51	0.50	0.48	0.46	0.44	0.41	0.38	0.36
TSS mgL^{-1}	332.80	326.40	320.00	307.20	294.40	281.60	262.40	243.20	230.40
$CO_3^{=}meqL^{-1}$	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
$HCO_3^- meqL^{-1}$	38.33	36.74	35.87	34.79	33.59	32.72	31.83	30.46	29.22
$Cl^- meqL^{-1}$	78.49	75.92	73.95	71.64	69.87	67.69	65.74	63.94	60.87
$SO_4^{=}meqL^{-1}$	215.98	213.74	210.18	200.77	190.94	181.19	164.83	148.80	140.31
$Ca^{++}meqL^{-1}$	12.20	12.13	12.03	11.92	11.67	11.49	11.29	11.12	11.02
$Mg^{++}meqL^{-1}$	4.17	4.10	4.02	3.85	3.77	3.58	3.37	3.18	2.95
Na^+meqL^{-1}	310.65	304.88	298.82	286.35	274.17	262.32	243.63	224.84	212.57
K^+meqL^{-1}	5.78	5.29	5.13	5.08	4.79	4.21	4.11	4.06	3.86
N $meqL^{-1}$	16.22	15.89	15.47	13.92	12.77	12.61	11.34	9.45	6.33
P $meqL^{-1}$	1.231	1.211	1.107	0.9871	0.9621	0.9423	0.8661	0.8531	0.8241
K $meqL^{-1}$	58.41	56.24	54.99	38.25	35.98	33.68	28.92	26.59	22.53
B mgL^{-1}	1.30	1.17	1.14	0.89	0.79	0.75	0.73	0.72	0.69
RSC $meqL^{-1}$	21.96	20.51	19.81	19.02	18.15	17.65	17.17	16.16	15.25
SAR	108.57	107.02	105.48	101.97	98.67	95.56	89.98	84.08	80.43
PS $meqL^{-1}$	186.48	182.79	179.04	172.02	165.34	158.28	148.15	138.34	131.02

Table 6. Effect of using sawdust and compost on treating agricultural drainage waste water sample of Mietghamer location (at three shaking and contact times and three sawdust concentrations):-

Component	0.5 %			1 %			1.5 %		
	30 minute	60 minute	90 minute	30 minute	60 minute	90 minute	30 minute	60 minute	90 minute
					Sawdust				
pH	8.35	8.28	8.23	8.18	8.12	8.07	7.98	7.85	7.70
EC dSm^{-1}	0.83	0.82	0.80	0.74	0.71	0.69	0.67	0.63	0.60
TSS mgL^{-1}	563.20	544.28	524.40	499.20	485.00	454.40	428.80	403. 20	384.00
$CO_3^{=}$meqL^{-1}	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HCO_3^{-}meqL^{-1}	74.88	72.43	70.69	68.49	66.72	64.85	62.72	60.89	58.74
Cl^{-}meqL^{-1}	166.72	156.96	148.92	135.97	130.27	126.11	122.92	119.65	116.85
$SO_4^{=}$meqL^{-1}	322.60	314.61	305.19	294.74	283.01	263.44	243.16	222.66	208.41
Ca^{++}meqL^{-1}	18.92	17.84	16.93	15.87	15.61	15.42	15.12	14.97	14.69
Mg^{++}meqL^{-1}	5.98	5.78	5.67	5.42	5.23	5.11	4.40	4.33	4.07
Na^{+}meqL^{-1}	532.26	514.43	496.36	472.28	453.70	428.69	403.61	377.41	360.09
K^{+}meqL^{-1}	6.04	5.95	5.84	5.63	5.46	5.18	5.04	4.89	4.65
N meqL^{-1}	12.75	11.79	11.74	10.86	10.60	10.36	9.45	8.62	8.19
P meqL^{-1}	0.1071	0.1071	0.1071	0.0952	0.0952	0.0952	0.0119	0.0119	0.0119
K meqL^{-1}	12.70	12.33	11.94	9.27	7.58	6.48	4.36	4.22	3.92
B mgL^{-1}	0.55	0.44	0.44	0.43	0.43	0.42	0.41	0.39	0.38
RSC meqL^{-1}	49.98	48.81	48.09	47.20	45.88	44.32	42.57	40.99	39.48
SAR	150.84	149.69	147.65	144.75	140.00	133.80	127.15	119.64	116.03
PS meqL^{-1}	328.00	314.26	301.51	283.34	271.77	257.88	244.50	230.98	221.05
					Compost				
pH	8.46	8.35	8.28	8.23	8.17	8.11	8.03	7.89	7.82
EC dSm^{-1}	1.12	1.09	1.07	1.02	0.97	0.93	0.89	0.86	0.81
TSS mgL^{-1}	716.80	697.60	684.80	652.80	620.80	595.20	569.60	550.40	518.40
$CO_3^{=}$meqL^{-1}	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HCO_3^{-}meqL^{-1}	79.93	77.85	75.47	73.61	71.65	69.55	67.68	66.49	64.29
Cl^{-}meqL^{-1}	176.85	171.64	168.82	162.47	157.96	155.69	151.83	148.38	144.72
$SO_4^{=}$meqL^{-1}	460.00	448.10	440.51	416.72	391.19	369.96	350.09	335.53	309.39
Ca^{++}meqL^{-1}	19.78	19.12	18.48	18.11	17.85	17.63	17.12	16.87	16.65
Mg^{++}meqL^{-1}	5.49	5.22	5.13	5.02	4.93	4.74	4.53	4.38	4.12
Na^{+}meqL^{-1}	684.60	666.63	654.70	623.46	591.99	566.96	542.29	523.66	492.38
K^{+}meqL^{-1}	6.93	6.63	6.49	6.21	6.03	5.87	5.66	5.49	5.25
N meqL^{-1}	12.75	12.31	12.12	11.91	11.86	11.41	10.84	10.63	10.34
P meqL^{-1}	0.1132	0.1121	0.1096	0.1071	0.0992	0.0976	0.0952	0.0833	0.0733
K meqL^{-1}	68.93	64.77	62.19	57.92	53.08	47.68	42.86	38.04	28.10
B mgL^{-1}	1.07	1.03	0.99	0.95	0.87	0.83	0.78	0.76	0.70
RSC meqL^{-1}	54.66	53.51	51.86	50.48	48.87	47.18	46.03	45.24	43.52
SAR	192.59	191.09	190.55	183.33	175.40	169.52	164.82	160.65	152.79
PS meqL^{-1}	406.85	395.69	389.07	370.83	353.55	340.67	326.87	316.14	299.41

Table 7. Effect of using sawdust and compost on treating agricultural drainage wastewater sample of El-Mansoura location (at three shaking and contact times and three sawdust concentrations):-

Component	0.5 %			1 %			1.5 %		
	30 minute	60 minute	90 minute	30 minute	60 minute	90 minute	30 minute	60 minute	90 minute
					Sawdust				
pH	8.50	8.42	8.34	8.20	8.13	8.02	7.80	7.71	7.56
EC dSm^{-1}	1.13	1.10	1.05	0.96	0.83	0.66	0.66	0.56	0.51
TSS mgL^{-1}	723.20	704.00	672.00	614.40	531.2	422.40	396.80	358.40	326.40
$CO_3^{=}$meqL^{-1}	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HCO_3^{-}meqL^{-1}	83.89	80.69	78.39	76.92	72.63	65.92	70.95	69.83	65.92
Cl^{-}meqL^{-1}	190.75	182.32	178.93	172.85	168.94	161.97	152.96	149.96	144.83
$SO_4^{=}$meqL^{-1}	442.56	434.96	408.68	359.65	283.63	184.51	170.89	138.61	115.65
Ca^{++}meqL^{-1}	43.38	40.82	35.91	34.38	30.21	25.05	30.86	26.94	20.87
Mg^{++}meqL^{-1}	14.82	12.69	11.44	16.18	16.02	15.82	15.11	14.63	14.32
Na^{+}meqL^{-1}	643.06	624.75	512.13	446.80	439.85	349.49	326.00	291.31	258.98
K^{+}meqL^{-1}	15.94	15.74	15.52	15.36	15.02	14.94	14.13	11.52	9.23
N meqL^{-1}	5.17	5.04	4.41	4.41	3.87	3.67	3.15	3.15	2.52
P meqL^{-1}	0.1309	0.1071	0.1071	0.0952	0.0952	0.0952	0.0952	0.0952	0.0833
K meqL^{-1}	54.11	46.88	42.31	33.67	32.38	30.32	27.43	24.66	20.12
B mgL^{-1}	1.41	1.28	1.26	1.25	1. 22	1.17	1.15	1.10	0.68
RSC meqL^{-1}	24.69	22.18	20.04	21.36	19.40	18.05	16.98	15.26	12.73
SAR	113.50	110.86	106.40	105.91	83.94	64.97	61.62	55.76	50.21
PS meqL^{-1}	412.03	399.83	383.27	352.67	310.72	254.22	238.40	219.26	202.65
					Compost				
pH	8.53	8.49	8.36	8.22	8.19	8.02	7.82	7.73	7.62
EC dSm^{-1}	1.27	1.12	1.08	1.02	0.96	0.93	0.91	0.87	0.84
TSS mgL^{-1}	812.80	716.80	691.20	652.80	614.40	595.20	582.40	556.80	537.60
$CO_3^{=}$meqL^{-1}	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HCO_3^{-}meqL^{-1}	86.73	84.57	81.22	78.64	76.92	74.39	72.84	71.57	70.22
Cl^{-}meqL^{-1}	192.77	189.22	186.92	185.13	182.42	179.62	177.12	175.33	172.22
$SO_4^{=}$meqL^{-1}	533.3	443.01	423.06	389.03	355.06	341.19	332.44	309.90	295.16
Ca^{++}meqL^{-1}	45.18	44.22	41.28	39.64	38.82	37.22	36.45	35.97	35.06
Mg^{++}meqL^{-1}	16.74	16.33	16.03	15.86	15.12	14.63	14.05	13.11	12.02
Na^{+}meqL^{-1}	734.14	640.96	618.03	581.68	545.37	528.26	517.37	494.56	479.17
K^{+}meqL^{-1}	16.74	16.29	15.86	15.62	15.09	15.09	14.53	12.66	10.05
N meqL^{-1}	6.73	5.67	5.43	5.22	4.62	4.41	4.28	3.72	3.15
P meqL^{-1}	0.1122	0.1089	0.1073	0.0985	0.0976	0.0952	0.0869	0.0833	0.0789
K meqL^{-1}	67.22	65.75	61.95	56.53	50.59	49.12	44.64	38.86	38.09
B mgL^{-1}	2.68	2.55	2.25	2.11	1.79	1.59	1.37	1.12	1.06
RSC meqL^{-1}	24.81	24.02	23.91	23.14	22.98	22.54	22.34	21.99	21.84
SAR	131.94	116.49	115.45	110.42	105.01	103.75	102.96	99.33	97.42
PS meqL^{-1}	459.42	410.72	398.45	379.64	359.95	350.21	343.34	330.28	319.80

Table 8. Effect of using sawdust and compost on treating industrial waste water sample of Delta Comp. of Fert. And Chem., Talkha location (at three shaking and three sawdust contact times and concentrations):-

Component	0.5 %			1 %			1.5 %		
	30 minute	60 minute	90 minute	30 minute	60 minute	90 minute	30 minute	60 minute	90 minute
					Sawdust				
pH	9.80	9.62	9.62	9.55	9.55	9.54	9.53	9.46	9.39
EC dSm^{-1}	3.18	2.87	2.71	2.55	2.50	2.16	1.44	1.40	1.37
TSS mgL^{-1}	2035.20	1836.80	1734.40	1632.00	1600.00	1382.40	921.60	896.00	876.80
$CO_3^{=}$ $meqL^{-1}$	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HCO_3^{-} $meqL^{-1}$	318.99	265.11	262.03	260.33	256.79	245.13	199.83	195.26	193.26
Cl^{-} $meqL^{-1}$	704.21	611.88	584.63	571.43	566.12	489.93	328.90	312.02	311.99
$SO_4^{=}$ $meqL^{-1}$	1012.00	959.81	896.94	800.24	777.09	647.34	392.87	388.72	371.55
Ca^{++} $meqL^{-1}$	83.22	77.94	75.85	75.19	74.22	72.98	69.89	67.10	65.82
Mg^{++} $meqL^{-1}$	40.64	37.12	36.83	36.06	34.85	31.74	28.71	27.39	26.93
Na^{+} $meqL^{-1}$	1839.23	1661.78	1563.73	1468.38	1439.39	1238.16	788.15	769.49	756.58
K^{+} $meqL^{-1}$	72.11	59.96	57.99	52.37	51.54	39.52	34.85	31.99	27.47
N $meqL^{-1}$	87.57	78.25	74.34	68.67	68.04	66.15	49.14	42.21	30.24
P $meqL^{-1}$	0.0952	0.0952	0.0833	0.0833	0.0833	0.0714	0.0714	0.0714	0.0595
K $meqL^{-1}$	16.04	15.87	14.64	12.62	11.85	11.84	7.53	6.94	5.36
B mgL^{-1}	4.95	3.69	3.45	3.33	3.01	2.46	1.57	1.00	0.60
RSC $meqL^{-1}$	195.13	150.05	149.35	149.08	147.72	140.41	101.23	100.77	100.51
SAR	233.71	219.09	208.33	196.88	194.91	171.11	112.24	111.93	111.09
PS $meqL^{-1}$	1210.21	1091.78	1033.10	971.55	954.66	813.60	525.33	506.38	497.76
					Compost				
pH	9.96	9.92	9.87	9.76	9.72	9.68	9.55	9.47	9.41
EC dSm^{-1}	4.88	4.73	4.65	4.53	4.46	4.33	4.11	3.87	3.79
TSS mgL^{-1}	3123.20	3027.20	2976.00	2899.20	2854.40	2771.20	2630.40	2476.80	2425.60
$CO_3^{=}$ $meqL^{-1}$	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HCO_3^{-} $meqL^{-1}$	380.11	375.83	369.94	365.48	360.22	356.74	352.66	345.78	340.11
Cl^{-} $meqL^{-1}$	1200.18	1189.48	1181.72	1172.22	1164.56	1159.35	1150.87	1141.22	1135.75
$SO_4^{=}$ $meqL^{-1}$	1542.91	1461.89	1424.34	1361.50	1329.62	1255.11	1126.87	989.80	949.74
Ca^{++} $meqL^{-1}$	90.93	90.77	89.38	88.22	86.92	85.22	84.93	83.89	82.52
Mg^{++} $meqL^{-1}$	46.86	45.66	43.56	41.92	40.22	38.94	37.79	36.85	35.91
Na^{+} $meqL^{-1}$	2904.01	2816.84	2778.87	2711.04	2672.34	2594.46	2456.79	2307.08	2261.60
K^{+} $meqL^{-1}$	81.40	73.93	64.19	58.02	54.92	52.58	50.89	48.98	45.57
N $meqL^{-1}$	141.12	138.61	122.45	105.36	98.91	91.74	88.29	76.12	68.04
P $meqL^{-1}$	0.1091	0.1071	0.0983	0.0973	0.0941	0.0869	0.0837	0.0714	0.0595
K $meqL^{-1}$	38.08	35.05	31.73	26.88	23.52	22.56	19.11	18.29	16.15
B mgL^{-1}	5.24	4.49	4.04	3.36	3.31	2.86	2.32	2.12	1.98
RSC $meqL^{-1}$	242.32	239.40	237.00	235.34	233.08	232.58	229.94	225.04	221.68
SAR	349.86	341.05	340.84	336.08	335.29	329.28	313.63	296.92	293.90
PS $meqL^{-1}$	1971.63	1920.42	1893.89	1852.97	1829.37	1786.90	1714.30	1636.12	1610.62

Table 9. Effect of using sawdust and compost on treating industrial waste water sample of food factory, Aga location (at three shaking and contact times and three sawdust concentrations):-

Component	0.5 %			1 %			1.5 %		
	30 minute	60 minute	90 minute	30 minute	60 minute	90 minute	30 minute	60 minute	90 minute
					Sawdust				
pH	8.50	8.46	8.41	8.22	8.11	8.07	8.02	7.99	7.92
EC dSm^{-1}	1.12	1.02	0.95	0.88	0.86	0.70	0.54	0.50	0.43
TSS mgL^{-1}	716.80	652.80	608.00	563.20	550.40	448.00	345.60	320.00	275.20
$CO_3^{=}$ $meqL^{-1}$	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HCO_3^{-} $meqL^{-1}$	68.12	62.93	57.88	53.22	50.57	48.11	39.69	36.82	33.59
Cl^{-} $meqL^{-1}$	167.99	162.11	155.69	149.87	143.33	137.93	112.91	101.97	98.11
$SO_4^{=}$ $meqL^{-1}$	480.69	427.76	394.43	360.11	356.50	261.96	193.00	181.21	143.50
Ca^{++} $meqL^{-1}$	39.98	36.29	33.96	30.65	29.93	26.93	22.63	20.87	18.85
Mg^{++} $meqL^{-1}$	13.47	12.11	11.98	11.52	10.00	9.03	8.40	7.50	6.64
Na^{+} $meqL^{-1}$	650.61	593.18	551.94	510.94	499.81	400.15	306.11	283.89	242.75
K^{+} $meqL^{-1}$	12.74	11.22	10.16	10.09	9.14	8.26	7.64	6.38	5.81
N $meqL^{-1}$	2.52	2.16	1.89	1.86	1.83	1.81	1.52	1.40	1.31
P $meqL^{-1}$	0.0357	0.0357	0.0357	0.0357	0.0238	0.0238	0.0238	0.0238	0.0119
K $meqL^{-1}$	19.16	18.86	17.76	17.36	16.87	15.80	9.36	8.17	6.21
B mgL^{-1}	1.75	1.71	1.62	1.51	1.49	1.43	1.39	1.31	0.09
RSC $meqL^{-1}$	14.67	14.53	11.94	11.05	9.12	8.52	7.84	7.09	6.95
SAR	125.85	120.58	115.15	111.27	109.78	89.93	76.70	73.63	66.51
PS $meqL^{-1}$	408.33	375.99	352.90	329.92	321.58	268.91	209.41	192.57	169.86
					Compost				
pH	8.65	8.60	8.54	8.50	8.47	8.44	8.37	8.33	8.28
EC dSm^{-1}	1.51	1.46	1.41	1.35	1.29	1.22	1.03	0.89	0.76
TSS mgL^{-1}	966.40	934.40	902.40	864.00	825.60	780.80	659.20	569.60	486.40
$CO_3^{=}$ $meqL^{-1}$	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HCO_3^{-} $meqL^{-1}$	82.71	80.22	77.42	73.75	69.39	65.47	62.85	59.22	55.12
Cl^{-} $meqL^{-1}$	181.73	178.22	173.85	167.34	164.12	158.97	156.86	149.92	144.76
$SO_4^{=}$ $meqL^{-1}$	701.96	675.96	651.13	622.91	592.09	556.36	439.49	360.46	286.52
Ca^{++} $meqL^{-1}$	44.00	43.86	42.76	40.94	39.11	36.22	35.47	33.94	31.86
Mg^{++} $meqL^{-1}$	14.38	13.92	12.93	11.87	10.11	9.53	8.47	7.59	6.64
Na^{+} $meqL^{-1}$	894.33	864.51	834.99	800.32	766.5	725.83	607.15	520.65	441.12
K^{+} $meqL^{-1}$	13.69	12.11	11.72	10.87	9.88	9.22	8.11	7.42	6.78
N $meqL^{-1}$	3.48	3.24	2.88	2.52	2.22	1.93	1.82	1.44	1.38
P $meqL^{-1}$	0.0589	0.0566	0.0539	0.0521	0.0476	0.0374	0.0357	0.0268	0.0238
K $meqL^{-1}$	30.79	29.87	24.72	18.36	17.50	15.82	9.58	9.42	7.62
B mgL^{-1}	2.88	2.78	2.45	2.37	2.16	1.92	1.76	1.62	1.22
RSC $meqL^{-1}$	24.33	22.44	21.73	20.94	20.17	19.72	18.91	17.69	16.62
SAR	165.53	160.84	158.23	155.74	154.50	151.75	129.53	114.25	100.54
PS $meqL^{-1}$	532.71	516.20	499.41	478.79	460.16	437.15	376.60	330.15	288.02

It can be concluded that sawdust is better than compost in remediation of these wastewaters

In general, soluble cations and anions were decreased as aresult for using both sawdust and compost after treatment . As concentration of both sawdust and compost increased as the concent of soluble cations and anions decreased. The same trend was observed with time of shaking and contact.

Not only the values of SAR, RSC and PS were decreased but also the values of pH, EC and TSS were decreased with increasing the concentration of used materials for remediation and also with increasing the contact time of sawdust and compost as remediators as (Rahman and Islam, 2009).

Data in tables (10-12) show the removal efficiency percentage of both sawdust and compost as remediation organic materials at three shaking and connection times and with three concentrations for both sawdust and compost for each type of wastewaters used in this study.

Generally, it can be noticed that the organic material sawdust is more effective in removing the pollutants from agricultural and industrial wastewaters compared to other organic material compost as (Robalds, *et al.*, 2016).

It may be due to presence of more charges on the surface of sawdust in comparison with compost concerning concentration of adsorbent material, it was observed that using both sawdust and compost at high concentration i, e 1.5 % was better than the low concentration in removing all parameters studied in these wastewaters taken from different locations. The highest values of removal efficiency percentage were obtained with 1.5 % concentration, while the lowest values were resulted from 0.5% concentration for both sawdust and compost as cleaners materials. Similar results were obtained by (Al-Riyami, *et al.*, 2014)

Table 10. Removal efficiency percentage of sawdust and compost at 0.5% concentration and at three shaking and contact times from studied different wastewaters samples:-

Wastewater Type and Location	Agric. Wastewater (Sherbien)			Agric. wastewater (Mietghamer)			Agric. wastewater (El-Mansoura)			Industrial wastewater (Delta Comp of Fert. & Chemi, Talkha)			Industrial Wastewater (food factory, Aga)		
	Shake 0.5h, day	Shake 1h,2days	Shake 1.5 h,3days	Shake 0.5h, day	Shake 1h,2days	Shake 1.5h,3days	Shake 0.5h, day	Shake 1h,2days	Shake 1.5h,3days	Shake 0.5h, day	Shake 1h,2days	Shake 1.5h,3days	Shake 0.5h, day	Shake 1h,2days	Shake 1.5h,3days
Sawdust															
pH	4.06	5.62	7.29	5.00	5.80	6.37	4.68	6.13	6.13	3.92	5.68	5.68	5.02	5.47	6.03
EC dSm^{-1}	5.45	12.72	12.72	30.70	33.07	35.43	33.13	34.91	37.86	41.43	47.14	50.09	31.28	37.42	41.71
TSS mgL^{-1}	5.45	12.72	12.72	30.70	33.07	35.43	33.13	34.91	37.86	41.43	47.14	50.09	31.28	37.42	41.71
$CO_3^{=}$ meqL^{-1}	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HCO_3^{-} meqL^{-1}	9.29	20.51	20.51	11.03	13.94	16.01	10.96	14.36	16.80	18.14	31.96	32.75	21.62	27.60	33.41
Cl^{-} meqL^{-1}	10.20	15.68	15.68	7.49	12.90	17.36	3.96	8.20	9.91	43.48	50.89	53.08	9.25	12.42	15.89
$SO_4^{=}$ meqL^{-1}	4.08	9.06	9.06	41.17	42.63	44.35	43.89	44.85	48.18	44.98	47.81	51.23	37.66	44.53	48.85
Ca^{++} mgL^{-1}	2.33	3.53	3.53	11.09	16.16	20.44	13.04	18.17	28.02	11.43	17.05	19.28	11.58	19.74	24.90
Mg^{++} mgL^{-1}	7.40	40.74	40.74	4.16	7.37	9.13	17.62	29.46	36.40	16.99	24.18	24.77	9.53	18.67	19.54
Na^{+} meqL^{-1}	5.39	11.93	11.93	31.55	33.85	36.17	35.35	37.19	48.51	43.27	48.74	51.77	32.74	38.67	42.94
K^{+} meqL^{-1}	16.83	50	50	20.52	21.71	23.15	15.92	16.98	18.14	19.84	33.34	35.53	19.16	28.80	35.53
N meqL^{-1}	18.47	23.65	25.00	1.00	8.46	8.85	68.28	69.07	72.94	55.01	59.79	61.80	92.72	93.76	94.54
P meqL^{-1}	98.58	98.71	98.82	89.53	89.53	89.53	98.20	98.53	98.53	98.19	98.19	98.41	99.75	99.75	99.75
K meqL^{-1}	81..27	82.36	83.17	82.96	83.46	83.98	41.50	49.32	54.26	66.22	66.58	69.17	70.34	70.80	72.51
B mgL^{-1}	59.39	63.04	63.30	87.13	89.70	89.70	66.79	69.85	70.32	20.93	41.06	44.89	50.87	51.99	54.51
RSC meqL^{-1}	14.58	24.80	24.80	11.77	13.83	15.11	6.26	15.79	23.91	20.92	39.19	39.47	45.28	45.80	55.46
SAR	4.06	4.58	4.58	28.04	28.83	29.56	33.52	35.07	37.68	39.06	42.87	45.68	28.67	31.65	34.73
PS meqL^{-1}	6.76	12.26	12.26	27.82	30.84	33.64	30.51	32.57	35.36	61.77	65.51	67.36	28.45	34.11	38.16
Compost															
pH	1.55	2.03	2.51	3.75	5.00	5.80	4.90	5.35	6.80	2.35	2.74	3.23	3.35	3.91	4.58
EC dSm^{-1}	5.45	7.27	9.09	11.81	14.17	15.74	24.85	33.72	36.09	10.12	12.89	14.36	7.36	10.42	13.49
TSS mgL^{-1}	5.45	7.27	9.09	11.81	14.17	15.74	24.85	33.72	36.09	10.12	12.89	14.36	7.36	10.42	13.49
$CO_3^{=}$ meqL^{-1}	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HCO_3^{-} meqL^{-1}	7.92	11.74	13.83	5.03	7.50	10.33	7.94	10.24	13.79	2.45	3.55	5.06	4.84	7.70	10.92
Cl^{-} meqL^{-1}	9.47	12.44	14.71	1.86	4.76	6.32	2.94	4.73	5.89	3.68	4.54	5.16	1.83	3.72	6.08
$SO_4^{=}$ meqL^{-1}	2.86	3.87	5.47	16.12	18.29	19.67	32.38	43.83	46.36	16.11	20.52	22.56	8.97	12.34	15.56
Ca^{++} mgL^{-1}	1.92	2.49	1.12	7.04	10.15	13.5	9.44	11.36	17.25	3.23	3.40	4.88	2.69	3.00	5.44
Mg^{++} mgL^{-1}	22.77	24.07	22.03	12.01	16.34	17.78	6.94	9.22	10.89	4.28	6.74	11.02	3.42	6.51	13.16
Na^{+} meqL^{-1}	5.33	7.09	8.94	11.96	14.27	15.81	26.19	35.56	37.87	10.43	13.12	14.29	7.54	10.62	13.68
K^{+} meqL^{-1}	3.66	11.83	14.50	8.81	12.76	14.60	11.70	14.08	16.35	9.51	17.81	28.64	13.13	23.15	25.63
N meqL^{-1}	16.04	17.75	19.92	1.00	4.42	5.90	58.71	65.21	66.68	27.50	28.79	37.09	89.95	90.64	91.68
P meqL^{-1}	80.94	81.25	82.86	88.93	89.04	89.28	98.46	98.51	98.53	97.92	97.96	98.13	95.94	96.09	96.28
K meqL^{-1}	32.33	34.84	36.29	7.56	13.14	16.60	27.33	28.92	33.03	19.81	26.19	33.18	52.34	53.76	61.73
B mgL^{-1}	66.16	69.54	70.32	74.96	75.90	76.83	36.88	39.94	47.00	16.30	28.28	35.47	19.14	21.95	31.21
RSC meqL^{-1}	7.69	13.78	16.72	3.51	5.54	8.45	5.80	8.80	9.22	1.79	2.98	3.95	9.25	16.29	18.94
SAR	1.18	2.59	3.99	8.13	8.84	9.10	22.72	31.77	32.38	8.77	11.07	11.13	6.18	9.04	10.32
PS meqL^{-1}	5.76	7.62	9.52	10.46	12.92	14.38	22.52	30.73	32.80	37.72	39.33	40.17	6.65	9.54	12.49

Table 11. Removal efficiency percentage of sawdust and compost at 1.0% concentration and at three shaking and contact times from studied different wastewaters samples:-

Wastewater Type and Location	Agric. Wastewater (Sherbien)			Agric. wastewater (Mietghamer)			Agric. wastewater (El-Mansoura)			Industrial wastewater(Delta Comp of Fert.&Chemi, Talkha)			Industrial wastewater (food factory, Aga)		
	Shake 0.5h ,day	Shake 1h,2days	Shake 1.5h,3days	Shake 0.5h, day	Shake 1h,2days	Shake 1.5h,3days	Shake 0.5h, day	Shake 1h,2days	Shake 1.5h,3days	Shake 0.5h, day	Shake 1h,2days	Shake 1.5h,3days	Shake 0.5h, day	Shake 1h,2days	Shake 1.5h,3days
Sawdust															
pH	8.13	8.73	8.97	6.93	7.62	8.19	8.58	9.36	10.56	6.37	6.37	6.47	8.15	9.38	9.83
EC dSm^{-1}	14.54	20.00	23.63	38.58	40.94	44.09	43.19	50.88	60.94	53.03	53.95	60.22	46.01	47.23	57.05
TSS mgL^{-1}	14.54	20.00	23.63	38.58	40.94	44.09	43.19	50.88	60.94	53.03	53.95	60.22	46.01	47.23	57.05
$CO3^{=}$ meqL^{-1}	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
$HCO3^{-}$meqL^{-1}	22.89	31.77	37.01	18.62	20.73	22.95	18.36	22.91	30.03	33.19	34.10	37.09	38.77	41.82	44.65
Cl^{-} meqL^{-1}	16.71	26.19	32.57	24.55	27.71	30.02	12.97	14.94	18.45	54.14	54.56	60.68	19.04	22.57	25.49
$SO_4^{=}$ meqL^{-1}	11.63	14.91	18.90	46.25	48.39	51.96	54.40	64.04	76.60	56.49	57.75	64.80	53.30	53.77	66.03
Ca^{++} mgL^{-1}	4.34	6.75	7.87	25.42	26.64	27.53	31.08	39.44	49.78	19.98	21.01	22.33	32.22	33.81	40.44
Mg^{++} mgL^{-1}	41.29	44.62	46.48	13.14	16.18	16.50	10.06	10.95	12.06	26.34	28.81	35.17	22.63	44.41	49.80
Na^{+} meqL^{-1}	13.81	19.60	23.20	39.27	41.65	44.87	41.41	54.07	64.86	54.71	55.60	61.81	47.18	48.33	58.63
K^{+} meqL^{-1}	51.83	52.00	59.16	25.92	28.15	31.84	18.98	20.78	21.20	41.78	42.70	56.06	35.97	42.00	47.58
N meqL^{-1}	28.05	33.90	36.60	15.68	17.70	19.56	72.94	76.25	77.48	64.72	65.04	66.01	94.63	94.71	94.77
P meqL^{-1}	98.89	98.89	98.95	90.69	90.69	90.69	98.69	98.69	98.69	98.41	98.41	98.64	99.75	99.83	99.83
K meqL^{-1}	84.12	85.49	86.75	87.56	89.83	91.31	63.60	64.99	67.22	73.42	75.04	75.06	73.13	73.88	75.54
B mgL^{-1}	63.56	64.08	64.86	89.93	89.93	90.17	70.56	71.26	72.44	46.81	51.92	60.70	57.60	58.16	59.85
RSC meqL^{-1}	28.41	43.16	50.10	16.68	19.01	21.76	18.90	26.34	31.47	39.58	40.13	43.09	58.78	65.98	68.22
SAR	8.95	11.96	14.38	30.95	33.21	36.17	37.97	50.84	61.95	48.66	49.17	55.38	36.93	37.78	49.03
PS meqL^{-1}	13.85	19.85	23.93	36.47	40.19	43.25	40.52	47.60	57.12	69.31	69.84	74.30	42.19	43.65	52.88
compost															
pH	2.87	3.46	3.94	6.37	7.05	7.73	8.36	8.69	10.59	4.31	4.70	5.09	5.02	5.36	5.69
EC dSm^{-1}	12.72	16.36	20.00	19.68	23.62	26.77	39.64	43.19	44.97	16.57	17.86	20.25	17.17	20.85	25.15
TSS mgL^{-1}	12.72	16.36	20.00	19.68	23.62	26.77	39.64	43.19	44.97	16.57	17.86	20.25	17.17	20.85	25.15
$CO3^{=}$ meqL^{-1}	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
$HCO3^{-}$ meqL^{-1}	16.43	19.31	21.40	12.54	14.87	17.36	16.53	18.36	21.04	6.21	7.56	8.45	15.15	20.16	24.67
Cl^{-} meqL^{-1}	17.37	19.42	21.93	9.84	12.35	13.61	6.79	8.15	9.56	5.93	6.54	6.96	9.60	11.34	14.12
$SO_4^{=}$ meqL^{-1}	9.70	14.13	18.51	24.01	28.66	32.53	50.67	54.98	56.74	25.98	27.71	31.76	19.22	23.22	27.85
Ca^{++} mgL^{-1}	4.18	6.18	7.63	14.89	16.11	17.15	20.54	22.18	25.39	6.11	7.50	9.31	9.46	13.51	19.90
Mg^{++} mgL^{-1}	28.70	30.18	33.70	19.55	20.99	24.03	11.83	15.95	18.67	14.37	17.85	20.46	20.28	32.10	35.99
Na^{+} meqL^{-1}	12.74	16.45	20.06	19.83	23.87	27.09	41.52	45.17	46.89	16.38	17.57	19.98	1.72	2.07	2.49
K^{+} meqL^{-1}	15.33	20.16	29.83	18.28	20.65	22.76	17.61	20.41	20.41	35.50	38.95	41.55	31.02	37.30	41.49
N meqL^{-1}	27.95	33.90	34.73	7.53	7.91	11.41	67.97	71.65	72.94	45.87	49.18	52.86	92.72	93.59	94.43
P meqL^{-1}	84.71	85.10	85.41	89.53	90.30	90.45	98.65	98.66	98.69	98.15	98.21	98.35	99.64	99.67	99.74
K meqL^{-1}	55.68	58.31	60.98	22.32	28.81	36.06	38.89	45.31	46.90	43.39	50.47	52.49	7158	72.91	75.51
B mgL^{-1}	76.83	79.43	80.47	77.77	79.64	80.58	50.30	57.84	62.55	46.33	47.13	54.32	33.46	39.35	46.09
RSC meqL^{-1}	20.05	23.70	27.82	10.89	13.73	16.71	12.14	12.75	14.42	4.62	5.54	5.74	21.89	24.76	26.44
SAR	7.19	10.19	13.02	12.55	16.33	19.13	35.33	38.50	39.23	12.37	12.57	14.14	11.73	12.43	13.99
PS meqL^{-1}	13.06	16.44	20.01	18.39	22.19	25.03	35.97	39.30	40.94	41.46	42.21	43.55	16.10	19.36	23.40

Table 12. Removal efficiency percentage of sawdust and compost at 1.5% concentration and at three shaking and contact times from studied different wastewaters samples:-

Wastewater Type and Location	Agric. Wastewater (Sherbien)			Agric. wastewater (Mietghamer)			Agric. wastewater (El-Mansoura)			Industrial wastewater(Delta Comp of Fert&Chemi, Talkha)			Industrialwastewater (foodfactory, Aga)		
	Shake 0.5h, day	Shake 1h,2days	Shake 1.5h,3day	Shake 0.5h, day	Shake 1h,2days	Shake 1.5h,3day	Shake 0.5h, day	Shake 1h,2days	Shake 1.5h,3day	Shake 0.5h, day	Shake 1h,2days	Shake 1.5h,3das	Shake 0.5h, day	Shake 1h,2days	Shake 1.5h,3day
Sawdust															
pH	8.97	10.16	10.16	9.21	10.69	12.40	13.04	14.04	15.71	6.56	7.25	7.94	10.39	10.72	11.50
EC dSm^{-1}	27.27	30.90	36.36	47.24	50.39	52.75	63.31	66.86	69.82	73.48	74.21	74.76	66.87	69.32	73.61
TSS mgL^{-1}	27.27	30.90	36.36	47.24	50.39	52.75	63.31	66.86	69.82	73.48	74.21	74.76	66.87	69.32	73.61
$CO3^{=}$ meqL^{-1}	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
$HCO3^{-}$meqL^{-1}	39.94	44.51	46.19	25.48	27.65	30.21	24.69	25.88	30.03	48.72	49.89	50.40	54.333	57.63	61.35
Cl^{-} meqL^{-1}	35.41	40.02	40.49	31.79	33.60	35.16	22.98	24.49	27.43	73.60	74.95	74.95	39.00	44.91	47.00
$SO_4^{=}$ meqL^{-1}	21.29	24.40	32.54	55.66	59.39	61.99	78.33	82.42	85.33	78.64	78.86	79.80	74.97	76.50	81.39
Ca^{++} mgL^{-1}	9.64	9.96	10.36	28.94	29.65	30.96	38.14	46.00	58.16	25.62	28.59	29.95	49.95	53.84	58.31
Mg^{++} mgL^{-1}	52.77	53.14	53.33	29.48	30.60	34.77	16.00	18.67	20.40	41.36	44.05	44.99	53.30	58.31	63.09
Na^{+} meqL^{-1}	26.86	30.73	36.56	48.10	51.46	53.69	67.22	70.71	73.96	75.69	76.26	76.66	9.05	9.12	9.25
K^{+} meqL^{-1}	63.16	63.66	63.83	33.68	35.65	38.81	25.47	39.24	51.31	61.26	64.43	69.46	51.52	59.51	63.13
N meqL^{-1}	34.78	52.63	67.85	26.63	33.07	36.41	80.67	80.67	84.53	74.75	78.31	84.46	95.61	95.95	96.21
P meqL^{-1}	99.07	99.07	99.26	98.83	98.83	98.83	98.69	98.69	98.86	98.64	98.64	98.87	99.83	99.83	99.91
K meqL^{-1}	87.30	88.56	90.02	94.15	94.34	94.74	70.34	73.34	78.25	84.14	85.38	88.71	85.51	87.35	90.38
B mgL^{-1}	67.98	74.75	84.90	90.40	90.87	91.10	72.91	74.09	83.98	74.92	76.68	77.47	60.97	63.22	74.73
RSC meqL^{-1}	52.87	60.61	60.19	24.85	27.64	30.30	35.53	42.06	51.67	58.97	59.16	59.26	70.75	73.55	74.07
SAR	16.81	21.05	27.53	39.34	42.93	44.65	63.91	67.34	70.59	70.73	70.81	71.03	56.52	56.52	62.30
PS meqL^{-1}	27.48	31.01	36.02	46.19	48.07	51.35	59.79	63.02	65.82	83.40	84.00	84.27	63.30	66.25	70.23
Compost															
pH	4.54	4.78	5.26	8.64	10.23	11.03	12.82	13.82	15.05	6.37	7.15	7.74	6.48	6.92	7.48
EC dSm^{-1}	25.45	30.90	34.54	29.92	32.28	36.22	46.15	48.52	50.29	24.30	28.72	30.20	36.80	45.39	53.37
TSS mgL^{-1}	25.45	30.90	34.54	29.92	32.28	36.22	46.15	48.52	50.29	24.30	28.72	30.20	36.80	45.39	53.37
$CO3^{=}$ meqL^{-1}	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
$HCO3^{-}$meqL^{-1}	23.54	26.83	29.81	19.59	21.00	23.61	22.69	24.03	25.47	9.50	11.26	12.72	27.69	31.86	36.58
Cl^{-} meqL^{-}	24.18	26.25	29.80	15.75	17.66	19.69	10.82	11.72	13.29	7.64	8.41	8.85	15.26	19.01	21.80
$SO_4^{=}$ meqL1^{-}	25.87	33.08	36.89	36.16	38.81	43.58	57.85	60.71	62.57	38.73	46.18	48.36	43.00	53.25	62.84
Ca^{++} mgL^{-1}	9.24	10.61	11.41	19.54	20.72	21.75	26.93	27.90	29.72	9.62	10.72	12.18	21.56	24.94	29.54
Mg^{++} mgL^{-1}	37.59	41.11	45.37	27.40	29.80	33.97	21.90	27.12	25.95	22.81	24.73	26.65	43.11	49.02	55.40
Na^{+} meqL^{-1}	25.75	31.48	35.22	30.26	32.66	36.68	47.99	50.28	51.83	24.22	28.84	30.24	37.23	46.17	54.39
K^{+} meqL^{-1}	31.50	32.33	35.66	25.52	27.76	30.92	23.36	33.22	46.99	43.43	45.55	49.34	48.54	52.91	56.97
N meqL^{-1}	41.30	51.08	67.23	15.83	17.46	19.72	73.74	77.17	80.67	54.64	60.89	65.04	94.74	95.84	96.01
P meqL^{-1}	86.59	86.79	87.24	90.69	91.85	92.83	98.81	98.86	98.92	98.41	98.64	98.87	99.76	99.82	99.84
K meqL^{-1}	66.49	69.19	73.89	42.52	48.98	62.31	51.74	57.99	58.82	59.75	61.48	65.99	85.17	85.42	88.20
B mgL^{-1}	80.99	81.25	82.04	81.75	82.21	83.62	67.73	73.62	75.03	62.94	66.13	68.37	50.58	54.51	65.74
RSC meqL^{-1}	27.82	32.07	35.89	18.74	20.14	23.17	15.18	16.51	17.08	6.81	8.80	10.16	29.46	34.01	38.00
SAR	18.10	23.47	26.79	21.37	23.36	27.11	39.70	41.82	42.94	18.22	22.58	23.36	26.58	35.24	43.01
PS meqL^{-1}	25.13	30.08	33.78	28.06	30.42	34.11	42.10	44.30	46.07	45.84	48.31	49.12	34.01	42.14	49.53

Taking in consideration the time of shaking and contact for studied wastewaters samples under study, it was shown that as shaking time increased as pollutants content decreased, It may be due to increase of exchange time which help in more adsorption for studied component in these wastewaters. This removal efficiency percentage ranged between 3-99 %.

This value differs from component to another because of its charge type (positive or negative)

It was also noticed that removal efficiency percentage-s were higher with industrial wastewaters compared to agricultural drainage wastewaters due to high contents of pollutants in industrial wastewaters than agricultural drainage wastewaters.

CONCLUSION

It can be concluded that using both sawdust and compost as organic sorbent materials are more beneficial in treating wastewaters (Agricultural, industrial and urban or domestic) with the super pass to sawdust because of their low-cost and, capability of remediation and finally safety for environment, soil and human health.

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إزالة الملوثات من المياه العادمة بإستخدام بعض المواد العضوية .

السيد محمود الحديدى[1] ، دينا عبد الرحيم غازى[1] ، إيمان محمود رشوان[2] و دينا لقمان إبراهيم[1]
[1]قسم الأراضى ـ كلية الزراعة ـ جامعة المنصورة، المنصورة ، مصر.
[2]قسم بحوث خصوبة الأراضى وتغذية النبات – معهد بحوث الأراضي والمياه والبيئة – مركز البحوث الزراعية.

أجريت دراسة بإستخدام نشارة الخشب والكمبوست لدراسة تأثير هذه المواد العضوية فى إزالة بعض الملوثات من عينات المياة العادمة المستخدمة فى الدراسة وهى مياة الصرف الزراعى ومياة الصرف الصناعى . حيث أخذت عينات مياة صرف زراعى من المنصورة وشربين وميت غمر ومياة صرف صناعى من مصنع طلخا للكيماويات والأسمدة ومصنع الأغذية المحفوظة بأجا ـ وقد أظهرت النتائج أن :ـ مادة نشارة الخشب قد اظهرت الأفضلية بدرجة عالية عن الكمبوست فى إزالة الملوثات والعناصر الضارة مثل البورون. استطاعت نشارة الخشب كمادة مدمصة فى تقليل قيم الرقم الهيدروجينى والأملاح والمواد الصلبة الذائبة والمواد الصلبة العالقة وكربونات الصوديوم المتبقية ونسبة الصوديوم القابل للإدمصاص والملوحة والبورون فى هذة المياه بعد المعالجة مقارنة بتركيزاتها قبل المعالجة و فى النهاية يمكن إستنتاج أن نشارة الخشب كانت الأفضل فى معالجة هذه الأنواع من المياه العادمة تحت ظروف الدراسة.